Chapter 1: Global Urbanization

Perspectives and Trends

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1.1 Perspectives on Urbanization

Urbanization is one of the most important global change processes. As the share of people in, and the footprint of, urban areas continue to grow globally and locally, understanding urbanization processes and resulting land use – both their patterns and intensity – is increasingly important with respect to natural resource use, sociodemographics, health, and global environmental change (Seto and Reenberg 2014). For decades, urban studies have been grappling with the question of how to define "urban"; the definition of urban includes comparatively straightforward official definitions, such as those that use the administrative unit with a set minimum number of inhabitants (McIntyre et al. 2000), but, in some cases, it also includes such factors as population density, built-up area (urban morphology), commuting density, travel distance (Nilsson et al. 2014), and proportion of workforce engaged in nonagricultural economic activities (Census of India 2011). In spite of this variety, official definitions do not accurately represent the urban in all its diversity. Even scholarly studies tend to adopt one or a subset of many perspectives in understanding the urban as a phenomenon, from the most well-understood demographic perspective (Kazepov 2005) to relatively more recently formulated or reformulated perspectives based on space (Angel 2010; Seto et al. 2011); urbanity (Boone et al. 2014); material and energy flows (Kennedy et al. 2007; Bai 2016); teleconnections (Seto et al. 2012); network and power hierarchies (Sassen 2001); ecology (Grimm et al. 2008); social ecology (Elmqvist et al. 2013); and urban policy and governance (Bai et al. 2010). Building an integrated systems approach in urban science and practice has also been called for (Bai et al. 2016; McPhearson et al. 2016).

Here, we will elaborate on a subset of these perspectives and discuss their roles in improving our understanding of the urban and urbanization processes.

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Note that some of the perspectives are covered in other chapters; for example, urban material energy flows are addressed in Chapter 4, urban ecology and cities as complex systems in Chapter 1.2, and urban policy and governance in several chapters and provocations in Parts II and III.

1.1.1 The Demographic Perspective

The first cities appeared many millennia ago (Kazepov 2005; Childe 1950). Since then, urbanization dynamics evolved substantially in time and space, but the most fundamental ingredient remained the same: people. In 1800, only 3 percent of the world's population lived in cities, but this figure rose to 47 percent by the end of the twentieth century. In 1950, there were 83 cities with populations that exceeded 1 million; by 2010, this number had risen to more than 460.

There is a linkage between demographic transition and urbanization in the form of a systematic trend whereby less developed economies tend to be more rural and to have higher birth rates (Lesthaeghe 2010). As the economy of a country develops, more of its population resides in urban areas with an accompanying fall in intrinsic birth rates (Lesthaeghe 2010); this can also be observed for the demographic (fertility) behavior of migrants (Milewski 2010) (see also Chapter 6). Thus, for example, rapidly growing African cities can be viewed as being in the early stages of this transition, while cities in Europe or the United States can be seen as reaching the later stages.

If we use the administrative definition of the urban, the most urbanized regions worldwide are North America (82 percent), Latin America and the Caribbean (80 percent), Europe (74 percent), and Oceania (71 percent) (UN 2014). In contrast, Africa and Asia remain mostly rural, with 41 percent and 49 percent of their respective populations living in urban areas. In particular, Nigeria, Ethiopia, Tanzania, and Kenya in Africa, and China, India, Indonesia, and Myanmar in Asia feature large rural populations. Regions that are less urbanized, such as Africa and Asia, are currently urbanizing faster than those with an already high share of urban population (Dahiya 2012b). Notwithstanding the current level of urbanization or the growth rate of their cities, all regions are expected to continue urbanizing over the coming decades.

Today, as in the past, the majority of the world's cities have been growing with a population growth rate of ≥1 percent up to >5 percent per year (Oswalt and Rieniets 2006; UN-Habitat 2016). However, there have always been cities and conurbations exhibiting negative net growth rates (Haase and Schwarz 2016; Figure 1.1). There are approximately 350–400 shrinking cities worldwide, most of them in the post-industrialized Western world, namely Europe and the United States, but also in Japan (Haase 2014). Urban shrinkage is by no means a new phenomenon: Several cities whose history goes back millennia – such

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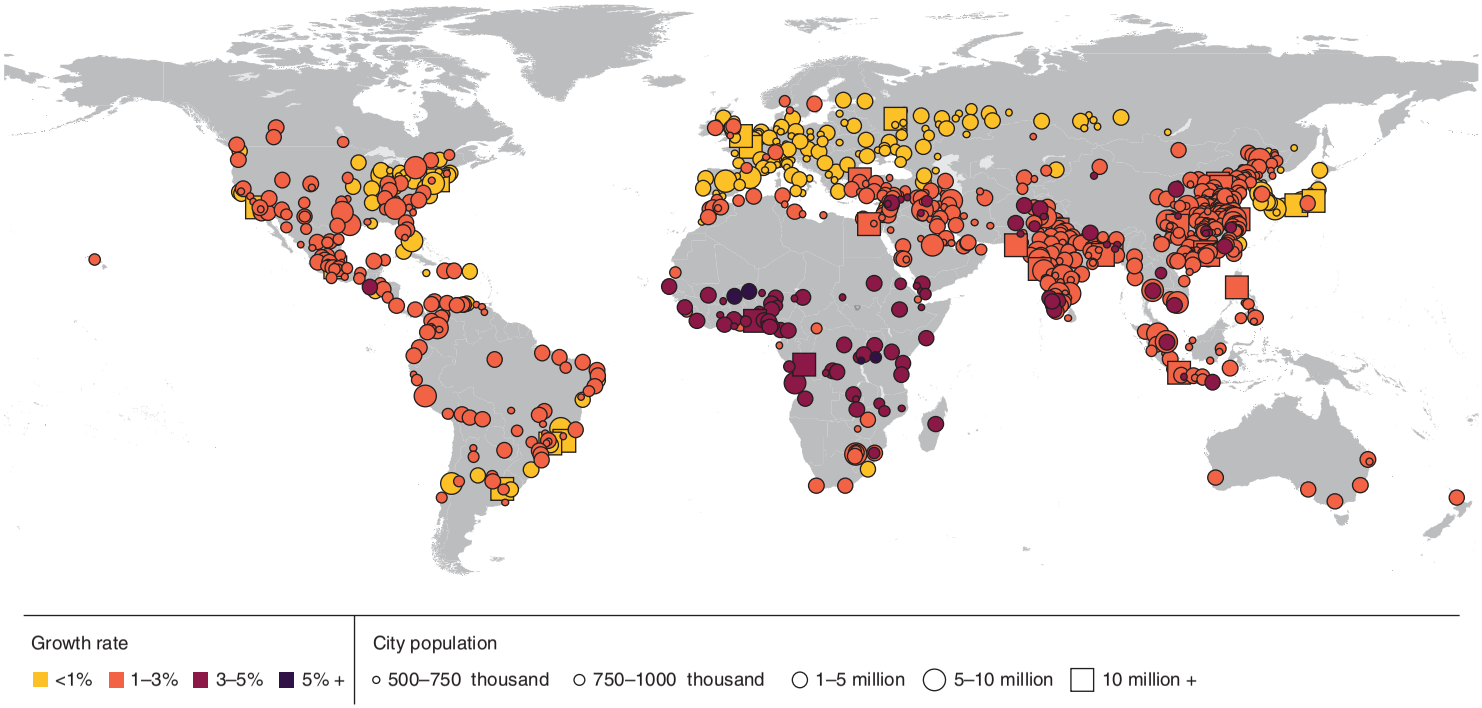

Figure 1.1 Growth rates of urban agglomerations by size class, 2014–2030. Source: Jerker Lokrantz/Azote, modified after World Urbanization Prospects, Population Division, UN 2014.

as Rome, the first megacity on the planet (Haase 2014), and Istanbul, capital of four empires over a span of two millennia (Necipoğlu 2010) – have undergone several cycles of growth and shrinkage.

Over the next few decades, urbanization will continue, particularly in Asia and Africa. According to the most recent estimates from the United Nations, two out of three inhabitants in 2050 will live in urban areas (UN 2014). Most of this urban growth will take place in Asia and the West African urban belt, with population growth rates of 3–5 percent per year (UN 2014a). However, global data also show that the growth rate of the urban population in the developing world is expected to fall from 3–5 percent per year to under 2 percent per year in 2030 (UN-Habitat 2010a, 2014). The UN predicts that, by 2050, 65 percent of populations in developing countries and nearly 90 percent of populations in developed countries will live in urban areas (UN 2014).

In many parts of the world, the physical expansion of urban areas has been faster than urban population growth (Angel et al. 2011a, 2011b), suggesting declining densities. Studies have also reported an accelerated decline in average household size over the past decades (Haase et al. 2013; Liu et al. 2003). Consequently, on the one hand, most cities in developed countries have been facing an increase in per capita living space, definitely one of the many factors significantly influencing the spatial (built space) growth of cities. On the other hand, such decline in household size in developing countries has exacerbated the lack of urban housing stock, which results in large slum populations, the global total of which were estimated at 862.6 million people in 2013 (UN-Habitat 2010a and 2010b). However, in some East Asian cities (particularly in China) and in Europe, significant increases in urban-built densities have also been observed over the last decade (Frolking et al. 2013).

1.1.2 Aging of the Urban Planet

Global population aging, including urban aging, is a process known as the "demographic transition," in which first mortality, then fertility decline. Decreasing fertility coupled with increasing life expectancy has been reshaping the age structure of the populations in most regions of the planet by shifting relative weight from younger to older age groups (Lesthaeghe 2010). In less developed regions, the aging index is 23; that is, we currently count 23 people older than 60 years of age for every 100 children younger than 15 years old. By 2050, the aging index is projected to almost quadruple, reaching 89 (UN 2017). Over the same period, in the developed world, the aging index is projected to increase from 106 to 215. The only exception to this trend is Africa, where, compared to all the other regions of the world, the aging index is forecasted to remain under 50 through 2050 (Figure 1.2). In cities, where women

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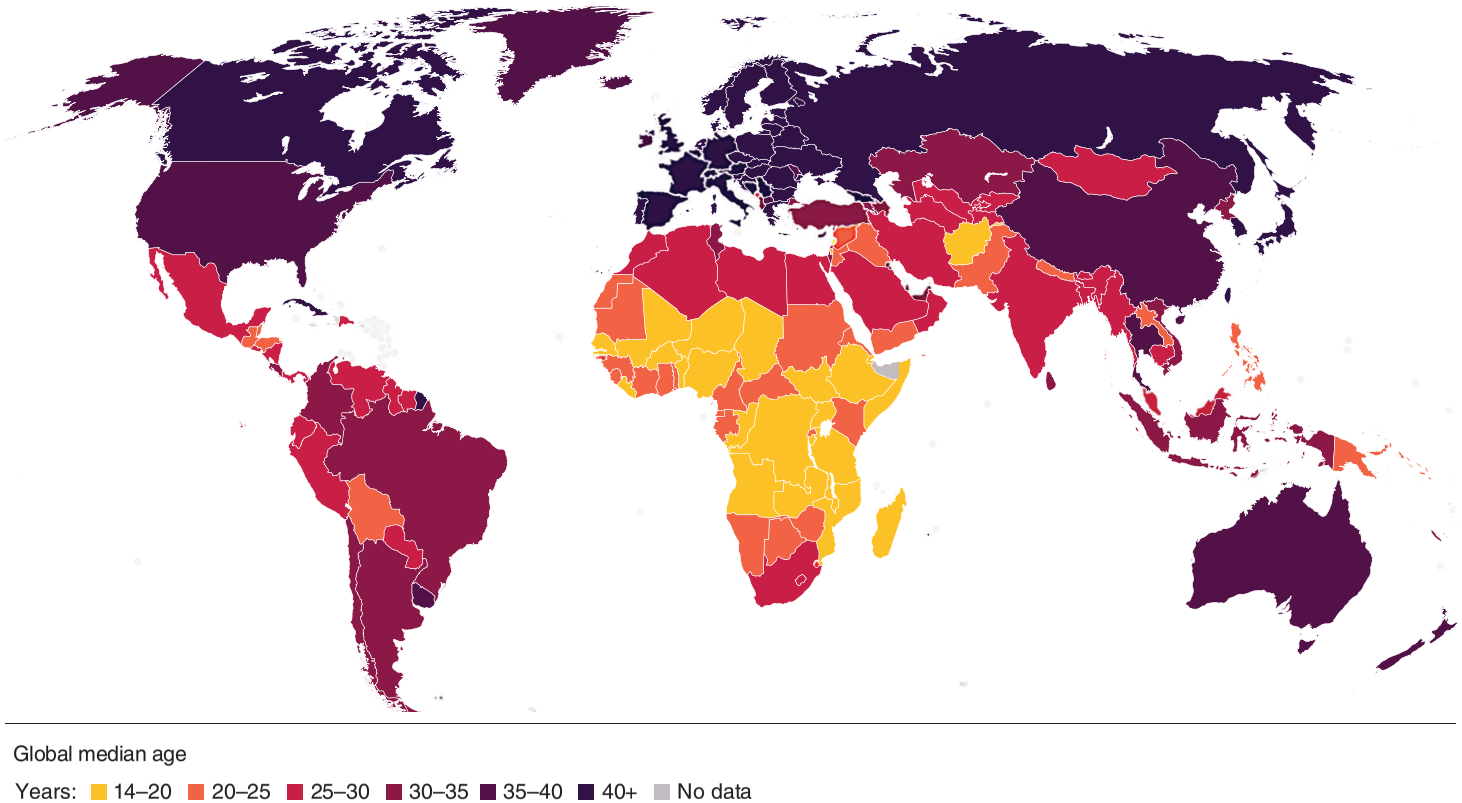

Figure 1.2 Median age by country for 2015. A youth bulge is evident for Africa and to a lesser extent for South and Southeast Asia and Central America. Source: Jerker Lokrantz/Azote, modified after UN Factbook.

are comparatively more educated, financially more independent, give birth later and where single-parent families are much more common, these trends are stronger.

There is another difference between urban aging in the developed, affluent urban areas and in the less developed, less affluent urban areas: Although the highest proportions of elderly persons are found in more developed cities, this age group is growing considerably more rapidly in the poorer and less affluent parts of the urban world, such as China and Thailand. As a consequence, older populations will increasingly be concentrated in less developed regions. Regardless of these trends, in both affluent and less affluent cities, older women generally greatly outnumber older men (UN 2017), as women tend to outlive men.

1.1.3 The Spatial Perspective

Global urbanization is a physical phenomenon as much as it is a demographic one. Although there has recently been an increase in attention given to global spatial patterns of urbanization, we have few theoretical explanations for the spatial configuration of large urban areas across regions and countries (Lynch 1961). Whatever theoretical knowledge on urban form exists has originated in urban planning and architecture, with an emphasis on intra-urban patterns and shapes (Jabareen 2006).

This trend, however, may be slowly changing. Over the past few years, several studies have shed light on the global patterns of actual built-up urban land and how it changed over the last four decades. A subset of these studies presents a "window into the future" (Fragkias et al. 2013: p. 418). Estimates of global urban land range from 0.2 percent to 2.4 percent of the terrestrial land surface (Potere and Schneider 2007; World Bank 2015). What is clear is that urban land is not equally distributed across the world due to geographic, climatic, and resource-related opportunities and constraints. Urban expansion over the last 30 years has been greatest along coastlines and low-lying coastal zones (Seto et al. 2011). Current urban hotspots are situated on the coastlines of South Asia, Southeast Asia, Southeast China, the United States' East Coast, Western Europe, Japan, West Africa, and the Atlantic coast of Latin America. With regard to coastal flood risks, nearly all of the 10 largest megacities are in developing countries. With regard to the value of property and infrastructure assets' exposure to coastal flood risks, a global ranking of megacities includes eight from Asia: Miami, Guangzhou, New York, Kolkata, Shanghai, Mumbai, Tianjin, Tokyo, Hong Kong, and Bangkok (Nicholls et al. 2008). Indeed, a recent study found that, at the turn of the twenty-first century, 11 percent of all urban land (over 70,000 km^2) was located within low-elevation coastal zones

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(Güneralp et al. 2015), defined as "the contiguous area along the coast that is less than 10 m above sea level" (McGranahan et al. 2007: p. 17). In addition, emerging coastal metropolitan regions in Africa and Asia are expected to have larger areas exposed to flooding than those in developed countries.

There is wide variability in terms of the spatial configuration of urban areas across different geographies around the world. An analysis of the similarities and differences in urban form and growth across 25 midsized cities from different geographical settings and levels of economic development revealed that although all 25 cities are expanding, those outside the United States do not exhibit the dispersed spatial forms characteristic of North American cities (Schneider and Woodcock 2008). There is a diversity of urban landscapes around the world with significant differences in spatial configuration among individual cities. However, there also seems to be a scale effect: While there is a tendency for increased landscape heterogeneity at individual-city scale, urban landscapes are increasingly becoming homogeneous at the global scale (Jenerette and Potere 2010). Though a variety of socioeconomic and biophysical factors influence the spatial growth of cities and their relative influence varies from region to region (Seto et al. 2012), it is claimed that globalization leads to a proliferation of similar urban forms across different geographies (Leichenko and Solecki 2005). At least one study found that income, in interaction with city size, appears to have a pronounced effect on urban growth, particularly in relatively smaller cities (Jenerette and Potere 2010). Importantly, the emerging urban agglomerations in the developing world appear to be more compact than their counterparts in Europe and North America (Huang et al. 2007).

Urbanization is arguably the most significant form of land-use and land-cover change because it has considerable effects on the pattern, dynamics, and functionality of ecosystems (Elmqvist et al. 2013). The process of urbanization can be clearly observed along the rural-urban gradient – that is, the ideal typical transect that links the urban (built, populated) and the rural (open, vegetated), which displays a typical configuration of population density, coverage of built-up area, respective impervious cover, and demographic structure, including lifestyles and travel behavior (Haase and Nuissl 2010). Along the rural-urban gradient, an increasing amount of land consumption – namely the transformation of green spaces to built-up areas, described as landscape urbanization, in contrast to demographic urbanization (Bai et al. 2011) – has been reported by many authors on the basis of field research and statistical data analysis (including McDonnell et al. 1997; Luck and Wu 2002; Lewis and Brabec 2005; Irwin and Bockstael 2007; Weng 2007; Yu and Ng 2007; Schwarz 2010). Likewise, the transformation along the rural-urban gradient has been detected by analysis of satellite imagery (including Lausch et al. 2015).

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In regard to those cities whose populations are stagnating or declining, Scheuer et al. (2016) show a similar phenomenon at work for the age of built-up urban land and its relative variability; they identified "mature" and "expanding" urbanization along a polynomial fit for all large cities across the globe. Their study therefore suggests that growing and shrinking cities lie along a continuum – in what appears to be a cyclic process – of demographic transition, economic development, and urbanization (Scheuer et al. 2016).

1.1.4 Re(new)ed Perspectives

Urbanization is a multifaceted phenomenon, with profound changes in land, socioeconomics including consumption patterns, institutions, and environment (Friedmann 2006; Bai et al. 2014). This diversity provides fertile ground for introduction of new – or renewed – conceptualizations to characterize the urban and different urbanization processes. In one of the more recent such conceptualizations, Boone et al. (2014: p. 313) proposed the concept of "urbanity," defined as "the magnitude and qualities of livelihoods, lifestyles, connectivity, and place that create urban-ness of intertwined human experiences and land configurations". The concept of urbanity emerges from of a growing consensus that the classic urban versus rural classification to categorize land is insufficient for planning, research, and analysis. Importantly, the concept of urbanity underscores a continuum which can be applied beyond the administrative boundaries of cities, and therefore can extend to multiple dimensions, including livelihoods, land uses, and economies. Urbanity can also be used to understand how land-use changes in nonurban areas are connected to underlying urbanization dynamics. In this way, urbanity is closely tied to another recent conceptual framework in land-use science: urban land teleconnections (ULTs). The ULT concept seeks to uncover the linkages between land-use change and underlying urbanization dynamics (Seto et al. 2012).

ULTs "refer to the distal flows and connections of people, economic goods and services, and land use change processes that drive and respond to urbanization" (Seto et al. 2012: p. 1). ULTs express that the linkages between urban land-use change and the ecosystem resources consumed by urbanites are not exclusively formed over short distances, nor are they exclusively place based. Rather, these linkages include many processes that urbanites influence in distant locations (Seto et al. 2012). ULTs allow us to shed light on rural land-use changes and migration that are driven by distal urban functions. For example, local or regional shifts in dietary preferences and consumption styles driven by urbanization and increasing incomes are reinforced globally, but also have impacts on distal places through information and material linkages. Thus, ULTs link decisions, actions, and land changes at both urban and rural ends of

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a continuum (Güneralp et al. 2013). "Telecoupling," a similar but broader concept, refers to the system-level interactions among different human and natural processes across a range of spatial and temporal scales as, for instance, in the case of urban water system (Deines et al. 2015). These systemic interactions have enormous implications for quality of life, economy, sustainability, and social equity in both urban and rural areas.

Despite being grounded in specific locations, cities can also be described as global entities or functional units whose influence reach far beyond their immediate vicinity. The concept of "global cities" considers some cities to be key nodes in the global economic, communication, and financial system (Sassen 2001). The global cities concept originates from social sciences – especially from urban studies – and follows the idea that global urbanization can be understood as a phenomenon that is largely created, facilitated, and enacted in strategic geographic locations. These locations, in turn, emerge as a consequence of a hierarchical network of the global system of finance, transport, money flows, and trade (Sassen 2001, 2008; see Figure 1.3).

Given the multifaceted nature of cities in a globally interconnected world and the sustainability challenges they face, an integrated systems perspective is required in urban research and practice (see, for example, Güneralp and Seto 2008). The current framework of cities as social-technological systems is too narrow and should be complemented by a view of cities as complex social-ecological-technological systems, as has recently advanced within urban ecology and social-ecological systems perspectives (Elmqvist et al. 2013). This advance is critical given that the continuum of urbanity includes many characteristics and processes other than the particular density of people or land area covered by human-made structures. Bai et al. (2016) call for the radical redesign of urban institutional structure and processes along with financing of systems approaches in urban governance and the creation of stronger systemic integration among science, policy, and practice. McPhearson et al. (2016) call for moving urban ecology towards an integrated urban science. A recent example of integrating different urban disciplines is a study attempting to build a conceptual bridge between the large body of empirical works on urban metabolism to urban ecosystem research through identifying eight energy and material flow characteristics of urban ecosystems (Bai 2016).

1.2 Urbanization Trends around the World

Throughout history, urban areas have shown immense variety and variability across different cultures and geographies, and even within the same cultural or geographical sphere. The earliest cities in Mesopotamia, the Indus Valley, and

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Figure 1.3 Facebook connections worldwide. Source: Jerker Lokrantz/Azote, modified after Facebook www.facebook.com/.

the Mediterranean region were highly compact in area, but a few were characterized by sizeable populations and densities. For example, Rome, in its heyday in the early third century CE, had 1.5 million inhabitants, a population count the city did not attain again until the 1930s (Davis 1955). The pre-medieval and medieval cities of Europe and Asia are typical examples of compact cities with midrise houses and high population densities. Regions with younger urbanization, such as North America, tend to develop less compact cities as a whole (Angel 2010).

Particularly in the developed world, post–World War II motorization, poor planning, and market failures led to urban sprawl, which is defined broadly as "excessive spatial growth of cities" (Brueckner 2000: p. 161) or, more specifically, as spatial growth of cities that creates forms of suburban development that lack accessibility and open space (Ewing 1997). As a spatio-temporal process, urban sprawl can be seen as a low-density expansion or "leapfrog development" of large urban areas into the surrounding rural landscape (Kasanko et al. 2006; Bengston et al. 2005). To give an example, from 1990 to 2006, urban land and associated infrastructure across Europe grew at an annual rate of about 1,000 km^2, which is equivalent to the entire area of the German capital of Berlin. Nevertheless, the most prominent case of this kind of urban growth has been the expansion of the cities in the United States in post–World War II era (Batty et al. 1999; Brueckner 2000).

The development of large suburbanized peripheries around historically compact European cities (Haase and Nuissl 2010) came to be known as the "Zwischenstadt" – a settlement form in between the urban and the rural (Sieverts 2003), which is mainly composed of detached houses and industrial, commercial, and retail sites that dominate the urban-to-rural interface (Meeus and Gulinck 2008; Nilsson et al. 2014). Conversely, rapidly growing urban areas in Asia and Africa display many rural features in their peri-urban spaces, including various forms of gardening and farming (McGee 1991). This type of growth is distinctly different than suburbanization seen in North America or Europe; such peri-urban spaces in East and Southeast Asia are called "desakota" after the Indonesian words "desa" and "kota" – "village" and "city," respectively.

Particularly after 1990, a considerable proportion of European cities, but also many cities in Japan, started losing population following significant fertility drops and out-migration; they were shrinking (Haase et al. 2013). Another prominent case of shrinkage – the US case – is less clearly related to fertility drops; rather, there have been large population shifts internal to the United States due to the disintegration of economies that were based on manufacturing and heavy industry in some regions, such as the Rust Belt and to the economic boom in others. Shrinkage today is ongoing, but it is accompanied by regrowth, with a return of the predominantly young and educated population

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to the city centers (Kabisch et al. 2010) (see Section 1.2.1 for more on urban shrinkage).

The cities in the developing world have also been differentiating over the last three decades. Whereas many millions of urban residents, who are typically concentrated in "informal" or squatter settlements in both inner and outer parts of these cities (Angel et al. 2011b; UN-Habitat 2010b; UN-Habitat 2014b), still face significant hardships and lack access to many urban amenities, affluent centers of innovation have also been developing and have been accompanied by increasing wealth, often in the same cities. These apparent contradictions are the most visible in rapidly growing cities of China, Brazil, India, Indonesia, Mexico, and South Africa, where the most affluent households often spatially segregate themselves from the poor majority in gated communities. Still, over the past few decades, declining urban population densities appear to be a hallmark of contemporary urbanization in most parts of the world (Angel et al. 2011a), a phenomenon that needs further investigation.

1.2.1 "Antipodes" of Urbanization: Urban Shrinkage

While rapid urban growth is presenting challenges for urban planners and policy-makers in certain parts of the world, in others, a contrasting phenomenon is presenting a completely different set of challenges: urban shrinkage. Urban shrinkage is characterized by many facets such as population loss; declining industrial and other economic activities accompanying underuse of buildings and urban infrastructure; declining population densities; vacant housing; fiscal constraints; and an increase in derelict land and brownfields as a consequence of land abandonment. A. Haase et al. (2012), D. Haase (2012), and Rink and Kabisch (2009) define urban shrinkage as a phenomenon of massive population loss in cities that results from a specific interplay of (1) economic (such as the Rust Belt of the United States), (2) financial, (3) demographic, (4) environmental, and (5) political changes or disruptions (such as in the former socialist countries in Europe) (Figure 1.4). Particularly prominent examples are the systemic changes that occurred across Central and Eastern Europe, including eastern Germany, after 1990, coupled with the introduction of a market economy (Moss 2008). Temporary shrinkage might also result from environmental disasters, such as Hurricane Katrina, which devastated the city of New Orleans in 2005, causing the city to lose a considerable part of its population; however, the population increased by 10 percent since 2010. Other examples of this hazard-driven shrinkage include Fukushima, Japan, or Pripjat in the Ukraine, where nuclear accidents led to massive or complete losses of the urban population; in these cases, a return is far from obvious.

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Figure 1.4 Regions of urban shrinkage in the world. Source: Kabisch et al. 2010.

Another reason for urban shrinkage is demographic change – namely low fertility and massive out-migration. The current processes determining urban shrinkage in Central and Eastern Europe have emerged in the form of the post-Soviet transition decline of traditional heavy industries. This decline induced general economic crises, unemployment, out-migration to other prospering regions, subsequent declines in fertility, and increases in population aging (D. Haase et al. 2012). Furthermore, widespread suburbanization in the peri-urban zones around shrinking cities leads to more residents abandoning the city and, eventually, to the development of "donut-cities," such as those in eastern Germany after 1990 (Couch et al. 2005) or Detroit in the United States.

Since about 2000, a new trend following peri-urbanization has been observed in some parts of the world: A number of cities in Germany, Central and Eastern Europe, and formerly shrinking parts of the eastern United States are no longer experiencing a loss in their population, but are regaining inhabitants. Positive migration balances are mainly based on intraregional in-migration and a considerable decline in out-migration (Kabisch et al. 2010). People are increasingly opting to stay in the city, even as suburbanization progresses. Concurrently, a discourse about a comeback of urban living – dubbed "reurbanization" – as a future scenario for a number of major cities in eastern Germany has come to the fore (D. Haase et al. 2008; Rink et al. 2012). Reurbanization is also currently being discussed in the United Kingdom and other European countries (Buzar et al. 2007; Colomb 2007) as well as in the United States (Cheshire 2006).

Reurbanization is a recent trend seen in cities that underwent a period of urban stagnation and decay (Wolff et al. 2017) followed by a new cycle of the demographic transition, economics, and urbanization. Reurbanization is characterized by a range of socio spatial processes not unlike gentrification, since taking advantage of the increasing affordability of real estate within inner city areas seems to be the main impetus. Its focus is clearly on the household dimension, as reurbanization processes are driven by households representing a range of socioeconomic groups (Kabisch et al. 2010).

Another recent trend, "Cittaslow," or "slow towns," originated and developed a firm foothold in Europe but is gradually being adopted in other parts of the world as well (Park and Kim 2016). Cittaslow is a network of 182 towns aiming to contribute to local urban development and thus to improve their quality of life (Hatipoglu 2015). The main goal of the Cittaslow approach is to broaden the philosophy of slow food to local communities and to the government of towns, applying the concepts of eco-gastronomy and local/traditional food production to the practice of everyday life. Municipalities which join the Cittaslow association are motivated by the idea of an urban area where humans are still protagonists of the slow and healthy succession of seasons. Cittaslow also means facilitating rich traditions of arts and craft in urban spaces with

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squares, theaters, shops, cafés, and restaurants, surrounded by unspoiled cultural landscapes. Other hallmarks of Cittaslow cities are spontaneity of religious rites and respect for traditions through the joy of slow and quiet living (see a review about urban cultural ecosystem services by Kabisch et al. 2014). Clearly, Cittaslow is a concept for affluent urban areas characterized by slow or no (population) growth. It is also, however, increasingly adopted by small towns and cities as an alternative to sustainable tourism development (Hatipoglu 2015; Park and Kim 2016). The Cittaslow approach is complemented by other similarly inspired ideas across the world, such as the "Life-based-City" (see the provocation by Cecilia Herzog in Chapter 21).

1.3 Future Trends of Urbanization

Current observations and statistical trends (UN 2014) suggest that the urbanization process will continue for the next few decades, further tilting the global demographic balance towards cities and towns. The UN projects that the world's urban population, almost 4 billion in 2015, will grow by about 75 percent until 2050, bringing the urban population up to 6.3 billion (2014). We must expect a highly uneven urban population development in less affluent regions due to segregation of the relatively fewer rich among many poor households – a pattern that we already observe in many fast-growing African megacities. Moreover, a larger number of future urbanites will concentrate in either medium-sized cities – most likely in Europe and parts of Africa and Asia – or megacities (defined as having a population of at least 10 million) mostly in Asia. This form of population concentration will put pressure on rural hinterlands and natural resources located within smaller city-regions and mega-urban areas (UN 2014).

Even more dramatic increases in population are forecasted for urban (built-up) land. In their middle-of-the-road scenario, Angel et al. (2011a, 2011b) forecasted that global urban land cover would be nearly 1.3 million km^2 by 2030 and 1.9 million km^2 by 2050, increases of 110 percent and more than 210 percent, respectively, since 2000. Seto et al. (2012) forecast that there will be a 185 percent increase in global urban land cover, with areas having a high probability of urban expansion amounting to 1.2 million km^2 from 2000 to 2030; urban expansion in Asia is expected to account for nearly half of this increase. More recently, Güneralp et al. (2017) projected that in all regions around the world, urban population densities will continue to decline with significant consequences for building energy use. They forecast that even if it is assumed that urban areas do not grow to be as geographically expansive as they have over the past few decades, urban population densities around the world are

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likely to continue to decline. For example, in North America, urban population densities overall are expected to decline from 2,100 capita per km^2 in 2010 to between 1,000 and 2,000 capita per km^2 in 2050. Comparatively, in South Asia, urban population densities are expected to decline from about 19,000 capita per km^2 to between 4,800 and 17,600 capita per km^2 over the same period.

Scenario analysis can be a powerful approach to studying the relative influence of different demographic, economic, technological, and environmental trajectories on the growth and spatial configuration of urban areas. The European Union's project, PLUREL (Peri-Urban Land Use Relationships), is a good example of this approach (Nilsson et al. 2015). Among the total of four scenarios they considered, a "Hypertech" scenario is likely to see small- and medium-sized towns becoming even more prominent, leading to increased peri-urbanization of rural areas. In a "Peak Oil" scenario, most people attempt to return to large cities because high transport costs will limit commuting distances. In their "Self-Reliance" scenario, considerable budgets will be spent on adaptation to climate change; people gravitate towards living in small, self-supporting communities. In the fourth scenario, where urbanized areas "Fragment," cities become more dispersed and more segregated as younger migrants inhabit city centers, while older residents escape to enclaves outside the city. Across all future scenarios that researchers explored in the project, urban expansion will continue at rates that are higher than those of any other land use (Boitier et al. 2008).

1.4 Towards a Synthesis: A Typology of Urbanization?

Spatial-temporal typologies of urbanization have been studied intensively by geographers, economists, and other social scientists for many decades (Haase and Nuissl 2010). The major factors that are thought to influence the aforementioned processes and types of urbanization are related to economic competition between different land uses/users (Thünen 1826; Alonso 1964) or between social/ethnic groups (Burgess 1925; Hoyt 1939; Harris and Ullmann 1945). More recent models regard the changing concentration of population in an urban area/agglomeration as key, and formulate a sequence of four phases of urban development: urbanization, suburbanization, desuburbanization, and reurbanization (Berg et al. 1982; Champion 2001; Kabisch and Haase 2011). Others approached the dynamics and transformation of urban development based on complex systems theory (Wilson 1976), the theorem of fractal development represented by means of cellular automata (White and Engelen 1993; Batty 2008) or systemic self-organization (Portugali 2000).

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The multifaceted nature of urban areas and urbanization defies sweeping categorizations. Nevertheless, scholars have proposed several typologies of urban areas; most are grounded in specific geographies based on their various characteristics, such as peri-urban areas (Gonçalves et al. 2017; von der Dunk et al. 2011); city-industry dynamics (Hatuka and Ben-Joseph 2017); urban energy use (Creutzig et al. 2015); urban green infrastructure (Koc et al. 2016); urban form (Jabareen 2006; Gil et al. 2012); metropolitan land-use patterns (Cutsinger and Galster 2006); national urban policy (Holland 2015); urban planning theories (Yiftachel 1989); and urban conflicts (Trudelle 2003). For example, a rare attempt to develop a formal typology of urban areas across the world proposed four city types based on the rates and patterns of their spatial growth (Schneider and Woodcock 2008): low-growth cities with modest rates of infill development (residential densification); high-growth cities with rapid, fragmented development; expansive-growth cities with extensive dispersion at low population densities; and frantic-growth cities with extraordinary land conversion rates at high population densities. Another attempt at a formal, global urban topology, based on design concepts, proposes a different set of types of sustainable urban forms (Jabareen 2006): the neo-traditional development, the urban containment, the compact city, and the eco-city. These limited-scope typologies and the collective body of work on the similarities and differences in urbanization trends around the world suggest that a broad typology of contemporary urbanization may be possible (see this volume's concluding chapter, "Synthesis").

1.5 Challenges and Opportunities of Urbanization Heading into the Twenty-First Century

Where will we stand at the end of the twenty-first century regarding urbanization? At 99 percent urbanites on earth? At 10 percent global urban land cover? These scenarios may seem preposterous, but they reflect an increasing realization that urban areas play increasingly influential roles in global change processes. It is this realization that led the United Nations General Assembly in September 2015 to adopt a full-fledged Sustainable Development Goal (or SDG) with a specific urban focus, SDG 11 (see https://sustainabledevelopment.un.org). The focus of SDG 11 is to "make cities and human settlements inclusive, safe, resilient, and sustainable." While the various targets under SDG 11 are laudable, moving towards them means considerable effort and creativity will be needed to overcome the challenges urban areas face today. One potential caveat of SDG 11 in this respect is its apparent overreliance on techno-managerial approaches and institutional arrangements (Caprotti et al. 2017). While metrics, indicators, and evaluation systems – all hallmarks of "smart cities"

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initiatives – can have their uses, they are not a panacea for the full spectrum of contemporary urban challenges. The issues revolving around the availability and veracity of the data that are needed to operationalize these metrics, indicators, and evaluation systems aside, there is a need to complement – and even contextualize – those data by approaches that heed political aspects and realities of urban challenges.

The challenges that urban areas will increasingly have to grapple with in the future involve climate change, access to basic services to secure human life, such as drinking water, food, clean air, healthcare (including basic sanitation requirements); and resilience to disasters (Dahiya 2012a, 2016); resilience is also listed among other SDGs to be met by 2030. By 2025, the annual rate of change of urban population is expected to be about 2 percent in developing regions and 0.5 percent in developed regions (UN-Habitat 2013), including extremely rapidly growing urban areas in the West African Belt and Asia, and shrinking cities in Europe, Russia, and the US Rust Belt (Dahiya 2012a; Haase 2013). This will result in an increasing number of affluent, stagnating, or shrinking cities mainly in developed countries, and less affluent, fast growing cities mainly in developing countries. Both trends create enormous challenges in terms of infrastructure management and local governance, as nearly 37 percent of the world's urban population currently lives in slums under inequitable conditions, and lack access to many urban amenities.

The notions of "circular urbanization," "circular migration," or "floating population," all of which describe rural residents who come to cities to work but can be mobile, moving between the urban and the rural, further complicate the picture (Overseas Development Institute 2006; UN-Habitat 2010b). For example, the floating population in all of China's cities amounts to 260 million individuals (UN-Habitat 2016). To accommodate such different trajectories of urbanization and types of cities, new approaches in urban policy and governance are needed. These approaches should take into account the spatial, temporal, and institutional scales inherent to urban governance. Furthermore, they need to be designed to empower urban stakeholders and to enhance public participation (Bai et al. 2010; Dahiya 2012b, 2014). To this list of challenges one can add promoting a fine-grained mix of housing types and providing attractive public realms, green-blue spaces, pedestrian-friendly streetscapes, and efficient, accessible public transportation, all of which are put forward by proponents of such urban design movements as New Urbanism.

Sustainable urbanization strategies need to focus on pro-poor dwelling developments, improved resource utilization, and better access to local economies to reduce unemployment and poverty as well as poverty-driven migration. New approaches of urban governance must be flexible to address emerging challenges effectively; for example, conceptual frameworks of urban planning may

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be more useful than an actual detailed plan, preparation of which often lags behind on-the-ground developments. Such an approach should also address formalization and regularization of land tenure, which represents a huge problem, especially in the cities of developing countries. Linkages among urban, peri-urban, and rural areas require improved coordination between urban governance and regional, national, and even international development planning. None of these challenges are insurmountable, and the very fact that there is an SDG – however imperfectly formulated – that directly addresses them raise hopes that they will be effectively tackled in the near future by urban and national governments.

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